

## Comparing responses of diatom species composition to natural and anthropogenic factors in streams of glaciated ecoregions

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With 1 figure and 5 tables

**Abstract:** We assessed land use and landscape characteristics, water chemistry, and diatom species composition in 122 streams of Michigan to evaluate the importance of natural and anthropogenic determinants of diatom species composition. Great variation was observed in land use and landscape characteristics, with only 14 and 4 % of that variation among sites explained by the first two principle components axes. Ranges in TP and TN concentrations, as well as high N:P ratios, indicated that most streams were phosphorus limited if nutrients were sufficiently low. *Amphora pediculus* (Kützing) Grunow and *Cocconeis placentula* var. *euglypta* (Ehrenberg) Grunow were the two most frequently observed of the 425 diatom taxa. Diatom species were characterized according to nutrient requirements based on traits in van Dam et al. (1994). A diatom nutrient index, percent low nutrient diatoms, and percent high nutrient diatoms were three indicators used to characterize species composition and responses to land use and landscape characteristics. The three diatom indicators of species composition were significantly related to both TP and TN. Forward stepwise regression showed that all were related to both natural and anthropogenic landscape-level factors. The proportion of the watershed with high permeability soils (outwash) and the wetland proportion of riparian zones were the two natural factors that were most highly related to diatom species composition; they were negatively related to the diatom nutrient index and percent high nutrient diatoms and positively related to the percent of low nutrient diatoms. Relative effects of natural versus anthropogenic effects on the three indicators of diatom species composition varied, but were relatively similar. Thus natural as well as anthropogenic factors are important determinants of diatom species composition and should be considered with assessing and managing the biodiversity of diatoms in streams.

## Introduction

Understanding the factors determining species composition and biodiversity is complicated by the complexity of ecological interactions among direct and indirect processes that operate at multiple spatial and temporal scales. This is particularly important at a time when losses in biodiversity are thought to be greater than at any time in the past, and these losses could be managed





